THE DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN DEVELOPING COUNTRIES

Resumo: O objetivo desse trabalho é estimar, com base em dados em painel para 33 países para o período 1975-2000, os principais determinantes dos IDEs em direção aos países em desenvolvimento. Fatores como o tamanho e o ritmo de crescimento do produto, a qualificação da mão de obra, a receptividade em relação ao capital externo, o risco do país e o desempenho das bolsas de valores estão entre os principais determinantes de IDE. Além disso, por meio da aplicação de uma teste de causalidade no contexto de dados em painel, foi possível mostrar que o investimento direto externo não tem efeito positivo sobre o PIB. Ao contrário, esse procedimento lidade mostrou que o PIB do país é que tem efeito sobre a entrada de IDE.

Palavras Chave: Investimento direto externo, países em desenvolvimento, dados em painel, modelo de efeito fixo, teste de causalidade.
JEL: F21, F41, F43
ANPEC: Área 3.

Abstract: The objective of this study is to shed light on the determinants of foreign direct investiment (FDI) in developing countries. In order to undertake it, we performe a econometric model based in panel data analysis for 38 developing countries (including transition economies) for the 1975-2000 period. Among the major conclusions we have that the FDI is correlated to level of schooling, economy's degree of openness, risk and variables related to macroeconomic performance like inflation, risk and average rate of economic growth. The results also show that the FDI has been closely associated with stock market performance. Lastly, a causality test between FDI and GDP is performed. There is evidence of the existence of causality in sense that GDP leading to FDI, but not vice versa.

Key words: Foreign direct investiment, developing countries, panel data, fixed effect model, causality test.
JEL: F21

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1. Introduction

The participation of developing countries in the total inflows of Foreign Direct Investment (FDI) has varied considerably over the last 25 years, increasing from 15% in 1980 to 46% in 1982, leveling off at slightly over 20% during the last four years. It must be pointed out, however, that the motives behind these international capital flows are still substantially different than those related to the inflows of FDI to developing countries, in spite of the changes that have taken place over the last decades. For example, the search for agricultural or mineral resources is much less important today than it was at the beginning of the 20th century.

On the other hand, the current movement of these flows is extremely complex, and is subject to a wide variety of factors related to the competitive environment in which the firms operate, to their specific characteristics, and to economic factors in the home and host countries.

The objective of this article is to estimate, based on panel data, the main determinants of FDI in developing countries. As shall be seen, factors such as the size and rate of growth of the product, the availability of skilled labor, the receptivity of foreign capital, the country risk rating, and the behavior of the stock market play important roles in FDI. Furthermore, by applying the causality test in a panel data context, it was possible to demonstrate the non-existence of the widely held belief that direct foreign investment has a positive effect upon the product. However, the procedure used to test causality showed, to the contrary, that this phenomenon acts in the opposite sense, i.e., that generally it is the country's product that affects direct foreign investment.

Our study is structured as follows: in Section 2 we provide a review of the theoretical literature dealing with the determinants of direct foreign investment. In Section 3, we examine recent studies that analyze the relation between FDI and several economic factors. In section 4, we outline our model and the hypotheses to be tested, and present the results obtained. The results are then analysed in Section 5. In Section 6 we test the causality relation between foreign investment and product. Lastly, in Section 7, we present the conclusions of our study.

2. The Determinants of FDI: Theory Overview

In this section, we review the theoretical literature dealing with the determinants of FDI. An aspect that stands out is that most of these studies emphasize factors that are specific to multinational firms, specifically those related to competition among the firms themselves and with local firms, with less attention being given to locational factors.

Although the first theoretical studies of the determinants of FDI go back to Adam Smith, Stuart Mill and Torrens, one of the first to address the issue was Ohlin (1933). According to this author, direct foreign investment was motivated mainly by the possibility of high profitability in growing markets, along with the possibility of financing these investments at relatively low rates of interest in the host country. Other determinants were the necessity to overcome trade barriers and to secure sources of raw materials.

Hymer (1960) ushers in a new tradition in the study of multinational firms (MNFs). If MNFs are able to compete with local firms that have a much better knowledge of the local and market and environment, it is because MNFs present some sort of compensatory advantage, such as:

- imperfect competition, for example, as a result of a product differentiation;
- imperfect competition in the factor market, for example, access to patented or proprietary knowledge, discrimination regarding access to capital, or skill advantages;
- internal or external economies of scale, including those arising from vertical integration;
- governmental intervention, i.e., restriction on imports.

With these advantages, MNFs would prefer to supply the foreign market by way of direct investments (in developing countries) instead of through (direct) exports. In an analogous manner, MNFs would not be willing to license production to local firms if the local firms were uncertain about the value of the license or if the know-how transfer costs (property rights) were too high.

Kindleberger (1969) slightly modifies Hymer's analysis. Instead of MNF behavior determining the market structure, it is the market structure – monopolistic competition - that will determine the conduct of the firm, by internalizing its production. Caves (1971), also develops a similar analysis, in which structure dictates conduct. FDIs will be made basically in sectors that are dominated by oligopolies. If there is product differentiation, horizontal investments may take place, i.e., in the same sector. If there is no product differentiation, vertical investments will be made, in sectors that are behind in the productive chain of firms. The existence of FDI is further related to trade barriers, as a way of avoiding uncertainties in supplies, or as a way of imposing barriers to new firms on the external market.

Thus, the hypothesis of direct investment being determined by specific assets that compensate the initial disadvantage faced by foreign firms in relation to local firms went on to become the HKC tradition, named after Hymer, Kindleberger and Caves. Markusen and Venables (1995) developed a model along the same line, comparing the importance of multinational firms to foreign trade. The presence of multinational firms (with regard to

trade) increases as countries become more similar in terms of income, and in terms of the relative allotment of factors and technology.

A second line of studies of the determinants of FDI is based on the idea of transaction cost internalization. Buckley and Casson (1976) and (1981), and Buckley (1985) were the first to develop this hypothesis, starting with the idea that the intermediate product markets are imperfect, having higher transaction costs, when managed by different firms. When markets are integrated by MNFs, these costs would be minimized. MNFs have proprietary assets with regard to marketing, designs, patents, trademarks, innovative capacity, etc., whose transfer may be costly for being intangible assets, or due to a good sense of opportunity, or even because they are diffuse, and thus difficult to sell or lease.

The internalization theory emphasizes the intermediary product market and the formation of international production networks. The theory's main strength may lie in its capacity to address the dilemma between the licensing of production to a foreign agent and own production. Therefore, the firm must make two decisions: location and mode of control. When production and control are located in the home country, the firm exports; when production and control take place in the host country, FDI is made. Normally, these decisions concern the several stages of product internationalization.

Also, within a framework that could be classified as microeconomic, there is the work of John Dunning. His analysis begins by stating that the ownership of dissimilar assets may be considered as one of the factors responsible for the existence of multinational firms. Dunning develops an approach that must be understood, in his view, as a paradigm (in the sense that it brings together conflicting theories, with no single outcome) known as OLI (Ownership, Location, Internalization). This paradigm may be schematically presented as follows:

Foreign firms hold advantages over domestic firms in a given sector as a result of privileged ownership of certain tangible or intangible assets that are only available to firms of that same nationality. (1)

Given (1), the foreign firm will decide whether its ownership advantage will be internalized or sold, if it holds an internalizing advantage (I). (2)

Given (1) and (2), the foreign firm will decide to produce in the host country if there are sufficient locational advantages (L) to justify production in that country, and not is any other. Dunning also introduces a fourth condition: compatibility between the foreign investment and the firm's long term strategy.

Based on this paradigm, Dunning outlines four reasons for a firm to invest abroad: the searches for resources, for markets, for efficiency, and for new strategic assets. The dynamics between knowledge assets and locational factors have dictated the upsurge in multinational investments over the last decades - mainly the search for strategic assets. In spite of the shifting, in recent years, of multinational activity towards developing countries, either market-seeking or resource-seeking, the main novelty is the increase in investments in developing countries in search of strategic assets, altering the nature of the locational factors. If, on one hand, knowledge assets (intangible) can cross national borders, with which multinational firms would have a competitive edge in seeking strategic assets in

countries other than their own, on the other, the location of these assets is increasingly influenced by the existence of activity clusters, which are complementary.

Another line of thinking is represented by the product cycle model proposed by Vernon (1966). According to this model, since innovations are labor savers, they (quais?) initially appear in those countries that are more capital intensive, especially the US (the model was developed in the mid-60s). Gradually, production is relocated to countries that are less capital intensive, and lastly, to developing countries. At the same time, production in richer countries is reoriented towards new products that incorporate innovations in products and processes. This model was partially responsible for a set of studies that regarded the spreading of multinational firms as being sequential, taking place in stages. The firms would initially supply the export market, then establish trade representatives abroad, and eventually end up setting up production in target markets by way of subsidiaries.

Also along the production internationalization line of thinking, for reasons endogenous to the firm, we have the studies developed by Graham [(1978), (1998) and (2000)]. According to these studies, the emergence of MNFs is a result of oligopolistic interaction as firms grow, as a risk reduction strategy. In his most recent study, the author employs game theory in order to develop a simplified two-country, one-sector model to analyse the entrance of a firm in a foreign country, and to study the reaction to the entrance of a firm from another country in the local market. The relevant point here is that the rivalry between firms is an important dimension which is not always considered in MNF studies.

One of the most promising approaches may be the work of Cantwell [summarized in Cantwell (2000)]. This approach considers the technological accumulation concept as an internal and cumulative process to the firm. Since technology is tacit, meaning that it is not transferred without costs, firms will develop their capacities and knowledge in unique and different manners. Thus, competition among firms is basically technological. Innovation is the main profit maker. The internationalizing of production allows firms to use their knowledge and innovating potential in other environments, increasing their specific advantages. Also, expansion leads to adaptation, allowing for more innovation.

Consequently, the firm then deploys its knowledge through international technology networks, investing in other centers so as to gain access to new knowledge. The Hymer-Kindleberger-Caves paradigm thus does not hold, for the internationalization of production is also kindled by technological competition.

2. Determinants of FDIs: empirical studies

Empirical studies that attempt to estimate the importance of the different determinants of FDI concentrate more on attraction factors, i.e., locational factors, since available data make it difficult to identify which countries the investments come from, unless a large set of countries and years is analysed. The capital propriety advantages, for example, mentioned in some of the studies outlined in Section 2 as an important *push-factor*, are more difficult to be observed, and depend on research involving firms. The main variables normally used are the size of the market, the rate of GNP growth, economic stability, the

degree of openness of the economy, as well as several other institutional variables, as shall be seen.

However, the relation between FDI and economic growth deserves special attention. If, on one hand, economic growth is a powerful stimulant to the inflow of FDI, on the other, an increase in foreign investment – since this would mean an increase in the existing capital stock (*greenfield investment*) – would also be one of the factors responsible for economic growth, meaning the existence of an endogeneity problem. There are, also, other studies that deal with proving the relation between FDI and the level of economic activity.

Regarding the determinants of FDIs, it must be stated that there are substantial differences between the flows that only involve developing countries, whether between home and host countries, and those in which the host countries are developing countries. According to Dunning (2002), in the former case strategic asset-seeking investments take place, in which FDI is used in mergers and acquisitions, seeking horizontal efficiency. In the second case, investments are characterized by the search for markets, and resources, thus being of vertical efficiency.

The next set of studies examined deals with FDI in developing countries. Nunnenkamp and Spatz (2002), studying a sample of 28 developing countries during the 1987-2000 period, find significant Spearman correlations between FDI flows and per capita GNP, risk factors, years of schooling, foreign trade restrictions, complementary production factors[1], administrative bottlenecks[2] and cost factors[3]. Population, GNP growth, firm entry restrictions, post-entry restrictions, and technology regulation all proved to be non-significant. However, when regressions were performed separately for the non-traditional factors, in which traditional factors were controls (population and per capita GNP), only factor costs produced significant results and, even so, only for the 1997-2000 period.

Holland and others (2000) reviewed several studies for Eastern and Central Europe, producing evidence of the importance of market size and growth potential as determinants of FDI. Tsai (1994) analysed the decades of 1970 and 1980 and addressed the endogeneity problem between FDI and growth by developing a system of simultaneous equations. Also, FDI was alternately measured as a flow, and as a stock. Market size turned out to be more important for FDI flows than growth. The trade surplus presents a negative sign and is significant for FDI, while the flow of FDI decreases as the nominal wage decreases. On the other hand, the impact of FDI on economic growth is quite limited.

Campos and Kinoshita (2003) use panel data to analyse 25 transition economies between 1990 and 1998. They reached the conclusion that for said set of countries FDI is influenced by economy clusters, market size, the low cost of labor, and abundant natural

[1] Local raw materials needed for internationally competitive production, based on a European Round Table of Industrialists (2000) – ERT - study.
[2] Also ERT (2000)
[3] Related to taxation, employment conditions, labor market regulation, the power of labor unions, also according to ERT (2000).

resources. Besides all these factors, the following variables presented significant results: sound institutions, trade openness, and lower restrictions to FDI inflows.

Garibaldi and others (2001), based on a dynamic panel of 26 transition economies between 1990 and 1999, analysed a large set of variables that were divided into macroeconomic factors, structural reforms, institutional and legal frameworks, initial conditions, and risk analyses. The results indicated that macroeconomic variables, such as market size, fiscal deficit, inflation and exchange regime, risk analysis, economic reforms, trade openness, availability of natural resources, barriers to investment and bureaucracy all had the expected signs and were significant.

Loree and Guisinger (1995) studying the determinants of foreign direct investment by the United States in 1977 and 1982 (both towards developed countries as well as toward developing countries), concluded that variables related to host country policy were significant in developed countries only when infrastructure was an important determinant in all regions.

The following studies sought either to determine the influence of FDI on GDP growth or to analyse the reverse causality between these two variables. Borensztein and others (1995) used data for the 1970 – 1989 period involving flows from developed countries to developing ones. The main conclusions were, in the first place, that FDI had a positive effect on economic growth, depending on the human capital stock available in the host economy. However, when the level of human capital was low, the effect was negative. Secondly, FDI had an indirect effect on growth by attracting supplementary activities.

Mello (1999) considered that FDI affects growth through the accumulation of capital as well as by the transfer of knowledge. These hypotheses were tested with time series and panel data. The time series results were not conclusive. The panel data showed that FDI has a positive effect upon growth as a result of the transfer of knowledge in OECD countries, but not in the rest. The effect upon the accumulation of capital was only manifested in the non-OECD countries. This indicates that the end result depends on the complementarity or substitution of foreign and domestic investment.

The several results obtained by Lipsey (2000) allows us to infer that the effect of FDI on growth is positive, but reduced, and depends strongly on the interaction with the level of schooling in the host country. Soto (2000), working with panel data for developing countries for the 1986-97 period, concluded that FDI contributes positively to growth through the accumulation of capital and the transfer of technology.

A causality test between FDI and product growth was proposed by Nair-Reichert and Weinhold (2001), based on panel data for 24 developing countries between the years of 1971 and 1985. The main conclusion here was that the relation between investments, whether foreign or domestic, and product growth was strongly heterogeneous, and that FDI efficiency was positively influenced by a country's degree of trade openness.

Lastly, Buckley and others (2002) used panel data for several regions in China for the 1989-98 period. In the first place, the author points out that if the rate of growth of FDI has

positive effect upon GDP[4] growth, the reverse does not hold true. Secondly, no evidence was found to support the hypothesis according to which the efficiency of FDI depends on a minimum level of human capital. Contrastingly, human capital is more significant in less developed provinces, while FDI stimulates growth notably in the more developed provinces.

3. Econometric Model

The previous section pointed out that there is a lack of studies covering a representative sample of developing countries and that use panel data methodology to analyse the determinants of FDI. However, as will be mentioned below, this methodology is able to produce superior results, and thus more precise conclusions.

The objective of this section is to outline the model used to empirically test the level of influence the aforementioned variables have on direct foreign investment. The panel data methodology was used, which combines information on the variation of the individual units, in this case developing countries, with information taking place over time. The advantage of this methodology is that it allows idiosyncrasies (heterogeneity) existing among groups (countries) to be considered.

The selection of variables that are representative of the determinants of FDI was necessarily affected by the option of using a sufficiently large sample of developing countries as hosts. The sample comprises a group of 33 countries, and covers the period between 1975 and 2000. Thus, from a theoretical standpoint, several important variables that were included in some of the studies reviewed above for a limited set of countries, such as those dealing with political stability, for example, were left out. A list of the countries and the sources of data are presented in the Appendix.

The variables selected to explain direct foreign investment in developing countries were product (GDP), the average rate of GDP growth over the previous 5 years (G5GDP), the level of schooling of the labor force (ESCOL), the degree of trade openness (OPENNESS), the rate of inflation (INFLATION), the risk rating (RISK), per capita energy consumption (ENERCON), the Dow Jones index (DOWJONES), and the average rate of growth of the largest OECD exporters of FDI to developing countries (GGDPOECD).

We initially examine the hypothesis regarding the expected behavior of the model's explicative variables. With regard to GDP, an attraction factor is considered here, since a great deal of the investments flowing into developing countries fit into a category Dunning (1993) calls *market-seeking*, as mentioned earlier. So, as in other studies, the correlation is expected to be positive.

It was stated above that some studies have shown that there is a positive correlation between direct investment and product growth. The hypothesis tested in this study maintains that FDIs react positively, not to current product growth, but to the trend in growth over a period of a few years. In order to test this hypothesis, the average rate of

[4] Gross Domestic Product.

product growth over the last five years is included as one of the determinants of FDI, represented here by G5GDP.

There is strong empirical evidence of the positive relation between FDI and the level of schooling of the labor force, which is measured here by the percentage of the corresponding segment of the population enrolled in secondary school - SCHOOL. The level of trade openness must also be positively correlated with direct investment, since this variable is a good proxy for the type of relation a given country has with foreign capital. It is believed that a country with a greater degree of trade openness, which is more directed towards the external market, would also be more open to foreign capital - OPENNESS.

The rate of inflation (INFLATION) acts as a proxy for the level of economic stability, considering that one of the classic symptoms of loss of fiscal or monetary control is unbridled inflation. Considering that investors prefer to invest in more stable economies, that reflect a lesser degree of uncertainty, it is reasonable to expect that inflation would have a negative effect on direct investment.

A country's risk rating, though more directly associated to credit conditions, also influences the inflow of FDI. The higher the rating, the greater the probability of defaulting on the foreign debt, which could consequently mean the imposition of restrictions on the outflows of international capital. Therefore, the risk rating is negatively associated to FDI inflows. Here, the variable RISK is represented by the risk rating measured by Euromoney.

In Dunning's view, the more sophisticated the industrial structure is, the more favorable are the strategic asset-seeking or efficiency-seeking FDI inflows. In order to measure the degree of development of the industrial structure, we have introduced the variable ENERCON, which measures the per capita energy consumption in host countries, whose expected sign is positive.

Above all in recent years, FDI has been closely associated with international mergers and acquisitions that, in turn, have been strongly influenced by stock market performance. So, during periods in which there were significant increases in this index - DOWJONES – reflecting moments of euphoria, investors have been more willing to make riskier investments. We therefore believe that there is a positive relation between direct investment in foreign countries and variations in this variable.

The variable GGDPOECD reflects the average rate of growth of the largest exporters of FDI[5]. The expected relation between this variable and FDI is, to a certain extent, ambiguous. On one hand, the positive correlation between GGDPOECD and FDI may be explained by the greater profit margins, and thus more available resources for investments abroad. On the other, a negative correlation between these two variables could be interpreted as risk diversification.

Our next task was to formally develop the panel data methodology in order to address the direct investment issue. In general, a panel data regression appears as follows:

[5] See Appendix.

$$y_{it} = \beta' x_{it} + v_{it}, \qquad i = 1,...,N; t = 1,...,T \qquad (1)$$

with $v_{it} = \alpha_i + u_{it}$

The dependent variable y_{it} was represented in the model by direct investment, and x_{it} represented the explicative variable vector that varies in i and t. Here, α_i is a stochastic term unique to the units for which $\alpha_i \sim (0, \sigma_\alpha^2)$, known as the individual effect, while u_{it} is a stochastic disturbance such that $u_{it} \sim (0, \sigma_u^2)$. We also have that $E[u_{it}\alpha_i] = 0$ and $E[u_{it}x_{it}] = 0$. The individual effect α_i, unique to the units, may or may not be correlated with the explicative variable vector x_{it}. The existence of a correlation between the individual effect and the regressors may be detected by applying the Hausman test (1978), whose null hypothesis is the non-correlation between α_i and x_{it}. In the case of there being a correlation, estimation must be done with a fixed effect estimator (LSDV)[6]. Otherwise, the random effect estimator would be the most appropriate.

In the current case, we have that x_{it} = [GDP, SCHOOL, G5GDP, OPENNESS, INFLATION, RISK, ENERCON]. If only variables of type x_{it} were present in our model, estimation could be done in a conventional manner. However, there are two variables in our database that only vary in time, and not in the individual units, namely, countries. Thus, in order to test this more general case, the model of equation (1) was rewritten as follows (Hsiao, 2003):

$$y_{it} = \beta' x_{it} + \delta' z_t + \alpha_i + \lambda_t + u_{it}, \qquad i = 1,...,N; t = 1,...,T \qquad (2)$$

where, z_t is the variable vector that only varies in t. In our case, we have that z_t = [DOWJONES, GGDPOECD]. We now note the presence of the term λ_t is specifically related to variation in time, comprising the regression's disturbance class along with $\lambda_i \sim (0, \sigma_z^2)$, $E(\lambda_t v_{it}) = 0$. We assume that z_t is not correlated with any other disturbance.

So, our objective was to obtain an accurate estimate for the parameter vector (β, δ), which was done by applying the two-stage procedure appearing in Hsiao (2003). The solution was obtained by estimating β by fixed effect restricted only to the variables x_{it}, then estimating δ by applying the OLS estimator in the following regression:

$$\bar{y}_t - b_W' \bar{x}_t = u^* + \delta' z_t + \lambda_t + \bar{u}_t, \qquad t = 1,...,T \qquad (3)$$

where $\bar{y}_t = \frac{1}{N}\sum_{i=1}^{N} y_{it}$, $\bar{x}_t = \frac{1}{N}\sum_{i=1}^{N} x_{it}$ and b_w is the estimated coefficient for β obtained by fixed effect. It must be kept in mind that in order for the procedure appearing in equation (3) to be applied, the Hausman must reject the null hypothesis of non-correlation between α_i and x_{it}.

[6] Least Square Dummy Variable

4. Result Analysis

In Table 1, we present the econometric results of the investment model that was estimated from panel data, according to what was outlined above. The data used are annual, and comprise 33 countries between the years of 1975 and 2000. The reason this time frame was chosen is because for the years prior to 1975, some of the variables used in the model are not available for most countries. Considering that the variable RISK, important in explaining direct investment, is only available as of 1985, the model was estimated for two samples: a complete one (1975-2000), and a partial one (1985-2000). The variable GDP were used in log.

For each one of these samples, the estimates were generated with the following models: (i) OLS (*pooling*), (ii) random effect panel, and (iii) fixed effect panel. In the latter, the coefficients of the variables that only vary in time were estimated by the methodology described in equation (3). The analysis here is quite similar to one appearing in Hausman & Taylor (1981), and Cornwell & Rupert (1988). The estimation by OLS with pooled data appears only as a reference, allowing us to check for the existence of multicolinearity in the model by way of a Variance Inflation Factor. The literature points out that there is indication of multicolinearity if the VIF is greater than 5 (Judge et alli., 1982). Estimation by OLS may also give some sort of indication of an efficiency gain by estimating the model with panel data.

As may be observed in Table 1, an efficiency gain is obtained by using panel data. In all the models for which this method was used, the RHO statistic and the Breusch-Pagan test revealed the importance of the individual component. The RHO statistic shows that the estimated proportion of the individual component variance in relation to the total variance of the disturbance is high. The need to consider individual differences is further corroborated by the Breusch-Pagan test, whose null hypothesis states that the variance of the individual component α_i be equal to zero. The results also show that there is a clear preference for the application of the fixed effect estimator, for the Hausman test indicated the presence of correlation between the individual component and the explicative variables. Thus, the more accurate models for each one of the samples are those appearing in columns (iii) and (vi).

It was also observed that in the pooled data model, some of the important variables, namely SCHOOL, INFLATION, RISK and G5GDP were not significant in the model estimated with the complete sample. Conversely, in all the other regressions for which the panel data technique was used, these variables proved to be significant. Also, all the significant values presented the expected signs.

According to Table 1, the results obtained for models (iii) and (vi) corroborate many of the hypotheses formulated initially. In fact, the average rate of GNP growth in previous periods - G5GDP - was significant, presenting a positive coefficient in both fixed effect models. The current rate of product growth was tested, but was not significant. As expected, the log of the product (LPIB) also positively influences direct investment. The variables QUALIF and OPENNESS presented positive estimated coefficients, and were also significant.

Considering the results in Table 1, the inflation used as a proxy for macroeconomic stability presented, as expected, a negative correlation with regard to direct foreign investment. However, for the more restricted sample, this variable proved to be of little significance, given the usual parameters. It is important to point out that the variable RISK is highly significant, presenting the expected sign. This shows that said variable is important, not only in explaining financial flows, as maintained by the usual hypothesis, but also for FDI flows.

Lastly, regarding the model's exogenous components, which only vary in time, the DOW JONES index proved to be significant, being positively correlated with FDI. On the other hand, the consumption of energy did not prove to be significant in either of the two samples. GGDPOECD is only significant (even so, at 10%) when RISK is not introduced.

Table 1. Panel Data Model for Foreign Direct Investment.

Dependent Variable =	**Log Foreign Direct Investment (LFDI)**					
	1975 - 2000			**1985 – 2000**		
Independent Variables =	**OLS (Pooling) (I)**	**Random Effect (II)**	**Fixed Effect (III)**	**OLS (Pooling) (IV)**	**Random Effect (V)**	**Fixed Effect (VI)**
LGDP (it)	1.0010 (0.000)	1.3204 (0.000)	1.4834 (0.000)	1.0541 (0.000)	1.2677 (0.000)	1.7282 (0.000)
G5GDP (it)	0.0145 (0.221)	0.0458 (0.001)	0.0481 (0.000)	0.0333 (0.005)	0.0553 (0.000)	0.0510 (0.000)
SCHOOL (it)	0.0006 (0.818)	0.0172 (0.001)	0.0266 (0.000)	-0.0015 (0.601)	0.0134 (0.013)	0.0250 (0.000)
OPENNESS (it)	0.0113 (0.000)	0.0143 (0.000)	0.0160 (0.000)	0.0115 (0.000)	0.0127 (0.000)	0.0146 (0.000)
INFLATION(it)	-0.0001 (0.641)	-0.0002 (0.024)	-0.0002 (0.019)	-0.0001 (0.564)	-0.0001 (0.061)	-0.0001 (0.108)
RISK (it)	_	_	_	-0.2055 (0.971)	-20.9666 (0.001)	-20.4480 (0.001)
ENERCON (it)	-0.0003 (0.000)	-0.0001 (0.365)	-0.0001 (0.713)	-0.0003 (0.000)	-0.0001 (0.000)	-0.0001 (0.316)
DOWJONES (t)	0,0003 (0.000)		0.0002 (0,000)	0.0002 (0.000)		0.0001 (0.000)
GGDPOECD (t)	-0.0434 (0,209)		-0.0649 (0.097)	-0.0118 (0.817)		0.0088 (0.849)
CONSTANT	-5.888 (0.000)	-9.9027 (0.000)	-12.1589 (0.000)	-6.2746 (0.000)	-8.3093 (0.000)	-13.8863 (0.000)
Observations	678	678	678	455	455	455
R^2	0.67	0.57	0.56	0.72	0.62	0.60
VIF	2.65 (0.37)	_	_	2.41 (0.414)	_	_

RHO	_	0.335	0.671	_	0.4844	0.836
Hausman test	_	49.12 (0.000)	_	_	74.70 (0.000)	_
Breusch-Pagan Test	_	411.41 (0.000)	_	_	297.19 (0.000)	_

Obs:1. The values between parenthesis represent the p-value. **2**. In models (III) and (VI) the coefficients of the variables (it) were calculated with fixed effect estimators. **3**. The variables expressed in monetary values were taken in log.

The model's efficiency gain may be initially observed with the use of panel data. However, in the pooled data model, SCHOOL and INFLATION are not significant, especially the former. On the other hand, in all the other regressions in which the panel data technique is used, these variables proved to be significant.

As pointed out earlier, the Hausman test indicates the presence of a correlation between the individual component and the regressors. However, this correlation is not verified for all the explicative variables, for there is a significant difference between the results obtained for the fixed and random effects (Cornwell & Rupert, 1988) for only two variables, SCHOOL and OPENNESS. Initially, it may be stated that if heterogeneity among countries is considered, the importance of having an environment that is favorable to foreign investment, represented here by the degree of trade openness, decreases while that of labor force qualification increases.

5. Verifying the existence of causality between FDI and GDP

In the previous section, we detected the existence of a contemporary correlation between these FDI and economic growth. However, we cannot categorically affirm that an increase in the level of activity causes foreign investment, is spite of this being a reasonable argument, since growth allows investors to project increased profitability, for example. In the same manner, it may be argued that an increase in foreign investment, above all in developing countries, by bringing in more knowledge and capital, would play an important role in the economic growth process. As was shown in Section 3, several studies have addressed this issue.

It is therefore important to determine the meaning of this causality. As opposed to what occurs in time series, for which there is a reasonably well established approach used to test causality, by way of the Granger (1969) procedure, in a panel data context research is still ongoing, and there still no widely adopted methodology that is used to deal with this type of problem, though some procedures do appear in the literature. Nair-Reicheit & Weinhold (2001) attempted to show the causality relation between growth and investment using an approach used by Holtz-Eakin et alli (1988), that consists of estimating the following relation, by way of instrumental variables:

$$y_{it} - y_{it-1} = \sum_{j=1}^{m} \alpha_j (y_{it-j} - y_{it-j-1)} + \sum_{j=1}^{m} \delta_j (x_{it-j} - x_{it-j-1}) + (u_{it} - u_{it-1}) \quad . (4)$$

The causality of x (FDI) in the sense of y (GDP) is accepted, if the joint hypothesis $\delta_1 = \delta_2 = ... = \delta_m = 0$ holds true. The weakness of applying this method in our study lies in the fact that in order for the causality relation to be consistent, it is necessary for the model to also develop the equation in which y causes x, so that the direction of the causality may be tested. Thus, as per the Granger (1969) approach for time series, it would be necessary to estimate a set of equations involving x and y, and not only one equation, as appears in Nair-Reicheit & Weinhold (2001) – meaning that a PVAR must be estimated.

In order to test the causality between FDI and GDP, we used the procedure appearing in Carroll and Weil (1994), and Judson and Owen (1999), who used macroeconomic panel data to study the long term relation between the rate of savings and per capita income growth. In order to adapt this methodology to our context, is was necessary to estimate two separate dynamic relations between FDI and GDP[7]:

$$LFDI_{it} = \beta_1 LFDI_{it-1} + \delta_1 LGDP_{it-1} + \alpha_{1i} + u_{2it} \quad (5)$$

$$LGDP_{it} = \beta_2 LGDP_{it-1} + \delta_2 LGDP_{it-1} + \alpha_{2i} + u_{2it} \quad (6)$$

So as to test for any causality relation between the variables appearing in (5)-(6), these equations were estimated separately. By hypothesis, we have that $LGDP_{it-1}$ is exogenous in (5), and $LFDI_{it-1}$ exogenous in (6). As may be observed, both equations include the lagged dependent variable as a regressor. In this case, the procedure that is normally used to estimate the model by fixed effect (LSDV) generates a biased estimate for the coefficients. Nickell (1981) obtained an expression for the β bias, showing that the bias tends to zero when the number of temporal observations T tend to infinite. Anderson and Hsiao (1981) proposed that an instrumental variable method be applied on the first difference, which in the case of equation (5) is expressed as follows:

$$LFDI_{it} - LFDI_{it-1} = \beta_1 (LFDI_{it-1} - LFDI_{it-2}) + \delta_1 (LGDP_{it-1} - LGDP_{it-2}) + (u_{1it} - u_{1t-1}) \quad (7)$$

It may be observed that in (7), the disturbance $u_{1it} - u_{1t-1}$ is now correlated with the independent variable $LFDI_{it-1} - LFDI_{it-2}$. Anderson and Hsiao (1981) recommend the instruments $LFDI_{it-2} - LFDI_{it-3}$ or $LFDI_{it-2}$. Here, the Granger causality, according to which $LGDP$ causes $LFDI$, is demonstrated, in case the null hypothesis of $\delta_1 = 0$ is not confirmed.

Table 2 presents the results of the Granger causality test between direct foreign investment and GNP, using the methodology proposed by Anderson and Hsiao (1981). The sample used was the complete one, covering the 1975 – 2000 period. It may be observed that in both equations (5) and (6), the coefficients estimated by fixed effect (LSDV) are also presented, so that an idea may be had of this estimator's bias, when compared with the results generated by AH.

[7] Here, both variables in log are taken.

Considering the results obtained, and in relation to the estimates obtained by the estimator AH, we may observe that there is an explicit causality relation according to which *LGDP* affects *LFDI* for, according to the results obtained by this method for equation (5), the first lag of *LGDP* is significant. The results obtained by AH for equation (6) indicate that there is no causality relation in which *LFDI* affects *LGDP*. Lastly, if the causality test were implemented with the fixed effect estimator, no conclusion would be reached regarding the causality of the model, since causality in both directions would not be negated.

Table 2.
Granger Causality Test (FDI x GDP)

Dependent Variable	**Log Foreign Direct Investment (LFDI) (5)**		**Log Gross Domestic Product (LGDP) (6)**	
Independent Variables	**AH**	**Fixed Effect (LSDV)**	**AH**	**Fixed Effect (LSDV)**
LFDI_1 (it)	-0.1924 (0.000)	0.6534 (0.000)	-0.0073 (0.210)	0.0867 (0.000)
LFDI_2 (it)			0.0019 (0.691)	-0.0293 (0.000)
LGDP_1 (it)	-0.4196 (0.000)	0.2036 (0.062)	-0.0055 (0.653)	0.4361 (0.000)
LGDP_2 (it)	-0.0095 (0.883)	-0.2758 (0.000)	-	_
CONSTANT	0.1336 (0.000)	2.7561 (0.000)	0.0635 (0.000)	5.5428 (0.000)
OBSERVATIONS	648	757	690	755

Obs: 1. Period: 1975-2000. **2**. AH: coefficients obtained by the Anderson-Hsiao procedure by instrumental variable. **3**. LSDV: Least Squares Dummy Variable.

6. Conclusions

The objective of this study was to shed light on the determinants of foreign direct investiment (FDI) in developing countries. In order to undertake it we performed an econometric model based in panel data analysis for 38 developing countries (including transition economies) for the 1975-2000 period. First of all, we were able to determine that both the size of the economy, as measured by GDP, and the average rate of growth in previous years, positively affected the inflows of FDI, being strongly significant.

The level of schooling also proved to be an important determinant of FDI, being highly significant as well. This demonstrates that a great deal of the direct investments in developing countries has been directed towards activities that are relatively

knowledge-intensive, and that policies aiming at increasing the level of education may induce these investments.

The coefficient of an economy's degree of openness (OPENNESS) was included as a proxy to reflect the willingness of a country to accept foreign investment, and proved to be important in attracting capital, considering that said variable presented the expected sign, and was highly significant.

Inflation (INFLATION) appears as an indicator of macroeconomic stability, presenting a negative sign in the larger sample. However, in the smaller sample, with the introduction of the variable RISK, it was not significant in the usual sense, in spite of the fact that its p-value was not excessively great. Nevertheless, a country's risk rating proved to have an important negative effect upon the inflow of direct investment.

One of the variables related only to the source countries of direct investment, namely DOW JONES, indicated that capital market growth in developed countries is a strong determinant of the outflows of these investments, especially in recent years.

Lastly, given the fact that there is still much debate regarding the causality relation between direct investment and GDP, a causality test between FDI and GDP was performed. There was evidence of the existence of causality in GDP leading to FDI, but not vice versa. This seems to confirm the case of China, for example, whose economy, which is the largest developing economy in the world, presenting one of the highest rates of growth in recent years, has certainly contributed towards being one of the largest recipients of foreign capital.

7. Appendix

a) List of host countries:

South Africa	Philippines	Poland
Angola	India	Qatar
Argentina	Indonesia	Russia
Bolivia	Lebanon	Senegal
Brazil	Malaysia	Singapore
Bulgaria	Morocco	Thailand
Chile	Mexico	Turkey
China	Mozambique	Ukraine
Colombia	Nigeria	Uruguay
South Korea	Panama	Venezuela
Ivory Coast	Pakistan	Vietnam
Egypt	Paraguay	Zambia
Ecuador	Peru	

b) List of OECD countries:

Germany	France
Belgium	Holland
Canada	Japan
Spain	Luxemburg
United States	Switzerland

c) Data Sources:

FDI and GDP - IMF's International Financial Statistics.
INFLATION, SCHOOL, ENERCON, OPENNESS and OECDGROWTH – The World Bank's World Development Indicators.
DOWJONES – IPEADATA.
RISK – Euromoney.

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